Impact evaluation on exoplanets considering the fluence of stellar high-energy particles

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The redefinition of the habitable zone (CHZ) around M-type stars was re-evaluated in the ExoKyoto exoplanet database, which compares different definitions of habitable zones, taking into account an assessment of stellar flare frequency and flare intensity on planetary boundaries, an assessment of estimated exposure on the surface of each planet, an assessment of the impact of atmospheric dissipation, and an assessment of CME fluence. The re-evaluation was attempted taking into account the evaluation of the impact of the flare frequency on the stellar surface, the evaluation of the estimated exposure on each planetary surface, and the evaluation of the CME fluence. In this study, for each of the 49 Earth-sized rocky planets in the habitable zone, we estimated the maximum flare energy that can occur once a year, the maximum flare energy, assuming an Earth-like atmosphere, based on the stellar rotation period, Rossby number and sunspot area estimated from Hα equivalent width observations of the host star with the Seimei telescope. The maximum flare energy that can occur once a year, the assumed exposure dose at 0.1 atmospheric pressure and 1 atmospheric pressure, and the atmospheric dissipation rate estimated from the assumed XUV of the star were estimated, respectively.

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